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ABSTRACT

A study was devised to determine the efficacy of picture sequencing as a method of evaluating a child's interaction with a film, particularly children who are low in verbal expression. A series of five photographs were used which illustrated important points in a film about the ill effects of smoking. Subjects were selected from two primary educable mentally retarded classes, two intermediate educable mentally retarded classes, and two nonhandicapped fourth grades. Each child saw the film (except for control subjects), was interviewed, and then was asked to sequence the five photographs. Results showed that those children who saw the film obtained higher sequence scores, that older children did better, and that sequence scores did not correlate significantly with scores on the interview (although the correlations were all positive). Thus, verbal interviews may not be tapping a child's ability and sequencing procedures may provide a better way to assess his abilities. (SH)

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PHOTOGRAPH SEQUENCING AS A METHOD OF EVALUATING THE KNOWLEDGE AND CONCEPTUALIZATIONS GAINED FROM A FILM BY PRIMARY AND INTERMEDIATE EDUCABLE MENTALLY RETARDED CHILDREN

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The Computer Based Project for the Evaluation of Materials for the Handicapped (CBP, 1969) is presently working on the evaluation of media for mentally handicapped children using the children's responses to visual/oral multiple choice questions as the primary evaluation data.

One evaluation device used is an individual interview in which the child is asked questions about what he has seen and heard while watching the film. During one of these interviews, a boy was observed who seemed to be low in verbal ability. (A check later with his teachers proved this was correct.) His scaler score on the interview (See Appendix A) was Verbal Ability - 1, Visual Experiences - 1, and Auditory Experiences - 1, out of a possible high scaler score of six. This same boy had also been observed during the film showing with his eyes glued to the screen from beginning to end and exhibiting various other non-verbal reactions (laughing, frowning, etc.) to the film at what seemed to be appropriate points for this behavior. Nevertheless, he scored very low (1,1,1) on the interview form. In other words, his observed responses to the film during the showing apparently were not measured by the verbal interview; i.e., according to the interview this boy had experienced no interaction with the film. It very well may be that he did not understand anything that he saw or heard during the film, but this seemed doubtful. This observer felt that this child's interaction with the medium had not been measured and that primarily, it was his lack of verbal expression that was the cause of our failure to measure the interaction.

BACKGROUND

A paper by Debes (1968) dealing with the topic of Visual Literacy discusses what television <u>does not</u> do for children. Debes believes that

TV does not give children an opportunity to arrange ideas and make meaningful visual statements. He also believes that verbal learning and cognitive sequencing seem to be helpfully affected by "visual literacy learning experiences" and that "this may be sufficient reason for using them." In the same article, Marianne Frostig (1966) sees "sequencing" as a visual motor skill that should be emphasized:

> In the population at the Frostig Center, sequencing has been found to be among the most frequently disturbed functions. Memory for sequences is needed in most learning; in spelling, arithmetic, social studies, and science. These abilities should be therefore practiced intensively.

Meeker (1969) also recognizes the importance of sequencing skills. She sees it as reflecting an ability to order information into a meaningful sequence and labels it in her Structure Of Intellect as Convergent Production of Semantic Systems (SOI cell, CMS). Many individual intelligence tests, such as the Stanford-Binet (Form LM) and the Illinois Test of Psycho-Linguistic Abilities (ITPA), use sequencing as an integral part of the test procedure.

QUESTION

Would it be possible to use picture sequencing as a method of evaluating a child's interaction with a film or filmstrip, especially children who are very low in verbal expression?

A study was visualized involving the use of a series of photographs. These photos would either be taken directly off a film or be posed photographs depicting the same concepts as shown in the film.

The following hypotheses would be tested:

H_0 When measuring a child's interaction with a film there is a significant correlation between verbal interview scores and non-verbal sequencing scores.

H_1 When measuring a child's interaction with a film there is no significant correlation between verbal interview scores and non-verbal sequencing scores.

H_2 Sequencing scores are not significantly correlated to Visual Experience scores as measured by the verbal interview.

H_3 Sequencing scores are not significantly correlated to Auditory Experience scores as measured by the verbal interview.

H_4 Sequence scores differ significantly according to grade level.

H_5 Children who have seen a film will have sequencing scores significantly higher than those who have not seen the film.

PROCEDURES

Materials

The film entitled BE SMART DON'T START was chosen for the study. It is a captioned film about the ill effects of smoking.

Instruments

The photo sequence used consisted of a series of 5 pictures showing the effects of smoke passing through fiberglass filled glass jars in a smoking dummy called "Smoking Sam." These pictures were photographed from the film and reproduced as 8 x 10 inch color prints. The "correct" sequence of the photographs is as follows:

Picture 1 -- A boy studying an unlit cigarette that he is holding in his hand. This shot appeared at the beginning of the film.

Picture 2 -- A picture of the glass jars outside the dummy. Contents white. (The jars contained white fiberglass.)

Picture 3 -- A shot of the glass jars inside the dummy. Contents still white.

Picture 4 -- A shot of a lit cigarette placed in the mouth of the dummy.

Picture 5 -- A shot of the glass jars in the dummy again, only this time the contents are black.

These pictures, especially 2, 3, 4, and 5 represented an important message in the film; that is, smoking affects your lungs.

The second instrument consisted of the standard interview form currently used with children who have seen a film at the Project. (See Appendix A.)

Sample

Ten children were randomly selected from each of the following classes: two primary educable mentally retarded classes, two intermediate educable mentally retarded classes, and two nonhandicapped fourth grades. These classes were arranged in a 3 x 2 design as shown in Table 1.

TABLE 1

	Nonhandicapped	Junior High EMR	Primary EMR
Saw Film	Sequence Scores and Interviews	Sequence Scores and Interviews	Sequence Scores and Interviews
Did Not See Film	Sequence Scores Only	Sequence Scores Only	Sequence Scores Only

Sequence scores were obtained from all the children but only one of the classes at each level saw the film.

Administration of Instrument

After each child saw the film he was interviewed using the interview form (shown as Appendix A) and then was asked to sequence the five photographs using one or more of the following statements.

"Put these pictures in the right order."

"Make these pictures tell the same story that you saw in the film."

"What picture leads to this picture?"

There was no time limit on this procedure. The order of the photographs as arranged by the child was recorded as a number sequence, using the numbers described above. The same sequencing procedure was followed with the children at each level who had not seen the film. A complete listing of the sequence scores is given in Appendix B.

After the child finished the photo sequencing exercise, if he placed pictures 2 or 3 before picture 5 (the clean white jars before the black jars), he was asked to explain why he did this. If he was able to describe the fact that it was the cigarette smoke that made the material in the jars turn black, he was recorded as a child who was able to verbalize an understanding of this concept. (See "Understood Concept" column in Appendix B.)

Scoring of Instrument

Two methods of scoring the sequence were investigated. In both, the Sequence 1, 2, 3, 4, 5 equaled 10 points. The first method (Method A) involved giving one point for each picture that was before a higher number but not necessarily immediately before it. For example 1, 5, 4, 3, 2 = 4 because, 1 does come before 5, 4, 3, or 2.

The following sequence: 4, 2, 1, 3, 5 = 6 because:

4 was placed before 5	1
2 was placed before 3 and 5	2
1 was placed before 3 and 5	2
3 was placed before 5	1
	6

Using this scoring method, a child is seemingly given credit for being able to express a general knowledge of the story the film was telling whether or not he saw the film. For example, in the sequence 4, 3, 1, 2, 5, the child gets credit for putting picture 3 (jars with contents white) before picture 5 (jars with contents black), regardless of the fact that 3 was not placed after 1 and 2.

A second scoring method (Method B) was examined whereby the child was scored on his ability to have the pictures in exact sequence (1, 2, 3, 4, 5) and given one point for each picture placed in the right sequence slot (1) (2), (3), (4), and (5).

For example: again 1, 2, 3, 4, 5 would = 10 points; but, 1, 5, 4, 3, 2 this time would = 1 point instead of 4 points as in the previous Method A. This is because only one picture is in the right "slot" (1) and the other pictures are not in a direct sequence such as 2, 3; 3, 4; or 4,5.

A sequence of 1, 4, 5, 2, 3 would be scored as 5. Only one picture (#1) is in the right "slot" (1 point); however, 4 and 5 are a direct sequence (2 points) and 2 and 3 are a direct sequence (2 points). So the total score= 5. This scoring method required a much more specific response and was concerned with children putting the pictures in the exact order they appeared in the film. Method B also would not give credit to a child who did put the number 3 picture (white jars) before the number 5 picture (black jars) if one or two pictures

were placed in between. For example, in the sequence 1, 4, 3, 2, 5: the child may be able to describe the concept of the fiberglass turning black due to the smoke but yet not have the correct sequence of 1, 2, 3, 4, 5. Indeed children did this, that is, sequenced the photos 1, 4, 3, 2, 5 and still explained the idea of the white material turning black due to smoking.

The two junior high classes (out of the six classes studied) showed significant Spearman Rho correlations when the sequences were scored both ways (Method A and B) and then rank ordered by the scores received. All rank order correlations are shown in Table II. (A rho of .5 was required for significance.)

Table II

Rank Order Correlations Between Scoring Methods A & B

Group	Correlation
Primary EMR (saw film)	.19
Primary EMR (did not see film)	-.01
Jr. High EMR (saw film)	.85*
Jr. High EMR (did not see film)	.63*
Nonhandicapped 4th grade (saw film)	.05
Nonhandicapped 4th grade (did not see film)	.23

* Significant at $p < .05$

Because of the divergence between the received scores particularly for primary and intermediate samples, Method A was chosen because it gives credit to children for a general conceptual understanding rather than an emphasis on one specific order or sequence. In other words, it was felt

that the child's understanding of the ill effects of smoking should be emphasized over his ability to order specific pieces or bits of information.

Future studies can be visualized where a definite order or sequence exists and where no order except 1, 2, 3, 4, 5 is acceptable. In that case scoring Method B would be a more appropriate choice.

Analysis of Data

A 3 x 2 analysis of variance of the sequence scores of all groups (See Table I) yielded the following results, as shown in Table III.

TABLE III

Comparison of Sequence Scores From All Groups

Source	SS	DF	Mean-Square	F
Level of Ss	1.2	2	.6	.25
Seeing film	35.3	1	35.2	14.7 *
Interaction	27.4	2	13.7	5.7 *
Error	129.8	54	2.4	
Total	193.7	59	3.3	

* Significant at $p < .05$

A significant F of 14.7 was obtained between the groups seeing and not seeing the film, suggesting that seeing the film assisted in obtaining higher sequence scores. The significant F of 5.7 for interaction of age level and viewing the film may result from the rather high scores received by both groups in the Junior high classrooms. Also, as Meeker suggests, sequencing skills improve with age and experience so older children may be expected to get higher sequence scores than younger children regardless of film effects.

Spearman rank order correlations were calculated comparing ranking of S_s by sequence scores to ranking by the verbal interview scores of visual and auditory variables as shown in Table IV. A Rho of .5[illegible] was necessary to be significant. All correlations were not significant at $p < .05$.

TABLE IV

Rank Order Correlations of Sequence Scores vs Verbal, Visual, & Auditory Interview Scores.

GROUPS	Sequence Scores compared to interview scores	
PRIMARY EMR	Verbal Expression	.39
	Visual Expression	.15
	Auditory Expression	-.12
JUNIOR HIGH EMR	Verbal Expression	.42
	Visual Expression	.46
	Auditory Expression	.42
NONHANDICAPPED 4th GRADE	Verbal Expression	.1[illegible]
	Visual Expression	.31
	Auditory Expression	-.43

DISCUSSION OF RESULTS

In comparing the correlations of sequence scores with the scores on the interview (Table IV), it is interesting to note that they are mostly positive correlations, (although none are significant.) The correlations between sequence scores and verbal expression can be viewed in two ways. If it is true that verbal expression is a good indication of intelligence, or in this case, sequencing ability, the positive correlations (.39, .42, and .18) can be cited as proof. On the other hand, if it is true that a child low in verbal expression is not necessarily low in other abilities (in this case, sequencing pictures) then anyone holding this opposite view can point to the fact that the correlations are not significant and that indeed it may be that some children low in verbal ability may be very "visually literate."

In light of the above results, the null hypothesis is rejected and hypothesis, H_1, of no significant correlation between verbal scores and sequencing scores is accepted, noting that a positive relationship seems to exist particularly for EMR children. Further studies in this area may be able to more clearly resolve the question of sequencing ability versus verbal ability. But from the results, it must be concluded that in this instance, sequencing ability is not significantly correlated to verbal expression as measured on the verbal interview.

The same rationale and findings apply to the correlations between sequencing scores and visual experience scores as measured by the interview: that is, positive correlations (.15, .46, .31) but no significant ones, were found. Consequently, hypothesis H_2 can be accepted.

Two out of the three groups showed a negative correlation between sequence scores and auditory experience as measured by the verbal interview (-.12, .43, -.43.) The negative strength of the correlation in this case seems logical because different stimuli modes are being tested. Sequencing, is mostly a response to visual stimuli while auditory experiences depend on what a child hears. These results lead to acceptance of hypothesis H_3, although the correlations may suggest a random effect.

There is nosignificant difference between sequencing scores of Primary, Junior High and Nonhandicapped groups as shown by the results of the 3 x 2 factorial Analysis of Variance. At first glance, this seems puzzling, but considering the fact that there were only five pictures to sequence and that these five pictures were testing only one concept it seems clear that the possible variance within and between groups was not great. In view of these findings, hypothesis H_4 has to be rejected. Further studies involving more strenuous sequencing skills, perhaps requiring the child to sequence more than one series of photos at different levels of difficulty may shed more light on this hypothesis.

The 3 x 2 analysis revealed a significant difference between the scores of children who had seen the film and those who had not ($F = 14.7$.) This supports the fifth hypothesis that seeing the film improves sequencing scores, thus saying sequencing is one technique that may have possibilities in evaluating the effect of media on handicapped children. The significant interaction ($F = 5.7$) may also suggest that some of the children in the groups that <u>did not see</u> the film had some previous knowledge about the effects of smoking.

IMPLICATIONS OF THE STUDY

Many of the following projections may seem appropriate only to EMR children but one need not limit his thinking just to the mentally handicapped. The use of sequencing as a teaching and evaluative tool may result in "killing lots of instructional birds with one sequencing stone."

For example:

1. Sequencing might be a way to break down the barrier between a teacher (or interviewer) who is looking for a verbal answer about a lesson (or film) from a child who is low in verbal expression. Indeed, the first words this observer heard from one child came when he was asked why he put picture 5 (the black jar) after picture 3 (the white jar). The interviewer could just make out the words he spoke: "from smoking." His teacher was equally amazed. Maybe the practice in verbal expression alone, is enough to justify the systematic use of sequencing as part of any EMR curriculum.

2. Sequencing can be used to teach and/or evaluate concepts a film purports to teach or concepts taught in a more traditional manner. Appendix B (Understood Concept) shows those children (about 80%) who responded correctly to questions about why they arranged the pictures as they did. Sequencing may be an alternative to paper and pencil tests traditionally used by teachers of EMR children.

   Sequencing skill kits, made up of a series of photo sequences, from the simple to the complex could be furnished with a film so that teachers can use them to evaluate how learning of the specific objectives of the film is progressing.

3. The evaluation of individualized instructional packages may be facilitated if sequencing materials accompanied the media, learning activity packages, or any other type of programmed instruction. Children might use these sequence packages with each other and be gaining valuable interpersonal communication skills as well.

4. The use of a set of photographs from which children can make up their own sequence may be one way of evaluating objectives in the affective domain, especially for films dealing with affect.

5. The utilization of subject matter films as a vehicle for teaching sequencing as a skill related to improving reading ability, and problem solving ability. This suggestion is underscored by the present concern on the part of reading specialists that reading skills are not being integrated into the content teaching areas (Herber 1970).

There are hundreds, indeed, thousands of films (and lessons) on every conceivable subject and all levels of difficulty that could be utilized, more effectively by classroom teachers as part of a systematic program of sequence skill teaching in conjunction with reading, language arts, or any other subject area.

If most EMR children are deficient in sequencing skills, then teachers should get on with the business of correcting that deficiency by formulating appropriate teaching strategies.

Hopefully, this brief study will be of some help.

SOME SOLICITED POST HOC OBSERVATIONS ABOUT THE STUDY

Some very cogent points have been raised by readers of the study. These criticisms have to do with the following areas: 1) sample randomization, 2) order effects in the interview and sequencing procedures for the experimental group, 3) the procedure used for scoring the sequence, and 4) the correlation statistic used.

It has been pointed out that by only randomly selecting students from individual rooms the sampling procedure was not true randomization; i.e., each child did not have an equal chance to be in either the group that saw the film or the group that did not. However, because of scheduling difficulties and other constraints, such as the availability of viewing equipment and facilities, it was necessary to fit the study into the schedule rather than the reverse.

The second point has to do with giving the interview before the sequence task to the children who saw the film. The observation being that it could have just as well been done after the sequence task and by so doing would not have introduced an effect between seeing the film and asking for the correct sequence.

There is a continuing debate regarding the choice of scoring procedures. Many readers still prefer the more exact method.

Finally, the type of correlation coefficient used was questioned by one reader who suggested that Kendall's tau would have been more appropriate.

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Herber, Harold -- Teaching Reading in Content Areas Prentice-Hall 1970.

INTERVIEW DATA

SCORES

MEDIA NO. _____ DATE: __/__/__ VERBALIZATION _____

TITLE: _____ VISUAL EXPERIENCES _____

SCHOOL I.D._____INTERVIEWER _____ AUDITORY EXPERIENCES _____

STUDENT:_____

1. What do you think the film was about?_____

_____

_____

2. Did you see any people? YES___ NO ___ What were they doing? Where were they?

_____

_____

3. Did you see any animals? YES___ NO___ What were they doing? Where were they?

_____

4. Did you like the film? YES___ NO___ What did you like best about the film?

_____

5. Did you hear any sounds in the film? YES ____ NO ____ What kind of sounds?

_____

6. What did you learn from the film? _____

_____

_____

7. Did you see the words printed on the pictures? YES ____ NO_____

8. Could you read the words printed on the pictures? YES _____ NO _____

9. Is there anything else in the film that you saw and would like to tell me about? _____

_____

10. Would you like to see the film again? YES _____ NO _____

APPENDIX A

VERBALIZATION: To express something in words: to name or describe in words: to express in empty, verbose, or pretentious manner.

Minimal or no verbalization.	Verbalizes somewhat--"Just answers the question."	Goes beyond "Just answering the questions." Somewhat verbose.	Considerable expression.	Highly expressive and verbose.

VERBALIZES VISUAL EXPERIENCES: Ability of child to express, describe, or name the activities, events, or scenes which he has seen in the film.

Does not name or describe any events in the film.	Does not know what the film was about but describes or names some events.	Knows what the film was about - describes or names some events that occurred.	Knows what the film was about - describes and names several events that occurred.	Describes or names in detail the events which occurred in the film.

VERBALIZES AUDITORY EXPERIENCES:: Ability of the child to express those things which he heard in the film, (i.e., talking (people), sound of objects, animals, music, etc.)

Does not describe or name any sounds (auditory experiences) which might have occurred in the film.	Remembers hearing something but cannot describe or name the sound.	Describes or names a few sounds (Auditory experiences.)	Describes and names all sounds in detail (auditory experiences) which occurred in the film.

APPENDIX A-1

DATA FROM ALL SIX GROUPS

10 Primary Educable Mentally Retarded Children Who Saw The Film

	Sequence Order	Score	Interview Scores			Understood Concept*
			Verbal	Visual	Auditory	
1.	1 4 2 5 3	7	1	1	1	yes
2.	1 2 3 4 5	10	3	1	1	yes
3.	1 4 2 3 5	8	2	3	4	yes
4.	1 4 2 3 5	8	3	3	1	yes
5.	1 4 2 3 5	8	2	3	2	yes
6.	4 2 3 5 1	4	2	2	2	no
7.	1 4 2 3 5	8	4	4	4	yes
8.	3 5 2 4 1	3	1	1	1	no
9.	1 2 4 5 3	8	2	4	1	yes
10.	1 4 2 3 5	8	1	3	3	yes

10 Primary Educable Mentally Retarded Children Who Did Not See The Film

	Sequence Order	Score	Understood Concept*
1.	3 1 2 5 4	7	no
2.	4 1 3 5 2	5	no
3.	5 2 3 1 4	4	no
4.	3 1 2 5 4	7	no
5.	4 1 3 2 5	6	no
6.	5 3 2 1 4	3	no
7.	4 1 3 5 2	5	no
8.	2 5 1 3 4	6	no
9.	2 1 3 5 4	8	no
10.	4 2 1 3 5	6	no

* That smoking cigarettes caused the jars (your lungs) to turn black.

APPENDIX B

10 Junior High Educable Mentally Retarded Children Who Saw The Film

Sequence Order	Score	Interview Scores			Understood Concept*
		Verbal	Visual	Auditory	
1. 1 2 3 4 5	10	2	4	3	yes
2. 1 2 3 4 5	10	3	4	4	yes
3. 1 2 3 4 5	10	3	3	2	yes
4. 1 2 3 4 5	10	2	3	4	yes
5. 1 2 4 3 5	9	4	4	4	yes
6. 1 2 4 3 5	9	2	3	1	yes
7. 1 4 2 3 5	8	2	3	3	yes
8. 1 4 2 3 5	8	2	3	1	yes
9. 1 4 3 5 2	6	1	2	1	no
10. 1 4 2 3 5	8	2	3	3	no

10 Junior High Educable Mentally Retarded Children Who Did Not See The Film

Sequence Order	Score	Understood Concept*
1. 1 4 2 3 5	8	no
2. 1 4 2 3 5	8	no
3. 4 1 3 5 2	5	no
4. 1 4 5 2 3	6	no
5. 1 4 2 3 5	8	no
6. 2 3 5 4 1	5	yes
7. 1 4 2 3 5	8	no
8. 1 4 3 2 5	7	yes
9. 2 1 5 4 3	6	yes
10. 4 1 3 5 2	5	no

* That smoking cigarettes caused the jars (your lungs) to turn black.

APPENDIX B-1

10 Nonhandicapped 4th Grade Children Who Saw The Film

	Sequence Order	Score	Verbal	Visual	Auditory	Understood Concept*
1.	1 4 3 2 5	7	2	3	4	yes
2.	3 2 4 5 1	5	2	3	4	yes
3.	1 2 3 4 5	10	3	4	1	yes
4.	1 2 4 3 5	9	3	3	4	yes
5.	1 2 3 4 5	10	4	4	4	yes
6.	1 4 3 2 5	7	4	4	4	yes
7.	1 2 3 4 5	10	2	3	1	yes
8.	1 3 2 4 5	9	4	4	4	yes
9.	1 4 2 3 5	8	4	3	4	yes
10.	1 4 2 3 5	8	3	5	5	yes

10 Nonhandicapped 4th Grade Children Who Did Not See The Film

	Sequence Order	Score	Understood Concept*
1.	1 4 2 3 5	8	no
2.	1 4 2 3 5	8	no
3.	1 4 5 3 2	5	no
4.	2 1 4 3 5	8	yes
5.	1 4 5 2 3	6	no
6.	2 5 3 1 4	5	no
7.	1 4 2 3 5	8	no
8.	1 4 2 5 3	7	no
9.	1 4 3 2 5	7	yes
10.	2 3 1 4 5	8	yes

* That smoking cigarettes caused the jars (your lungs) to turn black.

APPENDIX B-2